Industrial Planning with Models

By ROBERT F. WILKES, I.E. IV

In the bygone era of pre-war days, models were looked upon as a hobby, or as playthings—Hollywood camera props—which were used to film such things as airplane crashes, trains wrecks, or terrible fires. After the war began, models were used to solve some of the problems of training our fighting men to recognize planes, ships, and other fighting equipment both of our enemies and of our allies.

As our rapidly expanding industrial plant was being built, it became clear that a faster, easier, and more efficient method of plant layout was needed. Industrial engineers turned to models to eliminate the slower, more laborious two-dimensional method formerly used to lay out production facilities. The two-dimensional system consisted of first determining the machine tools necessary to do a certain job; then, on paper, charting the flow of materials through the plant and drawing the machine tools, aisleways, and working space to scale in their proper location. The three-dimensional system consists of first determining the required machine tools, formulating a rough material flow system, and then placing the machine tool models in their proper positions. The final refinements in spacing and material flow can be determined merely by looking at the rough three-dimensional layout.

Last quarter, the students in "Chief" Younger's plant layout laboratory decided, with Professor Younger's consent and assistance, to use the three-demensional system to lay out the factory which was being developed as a laboratory project. The plant which we were to develop was required to produce and assemble bench type drill presses at the rate of 100,000 complete drill presses per year.

Our first problem was to determine, by estimating the production time of each part of the drill press, the type of machine needed and the number of machines needed to produce one part per minute The selection of machines was made with the aid of the machinery file which is being

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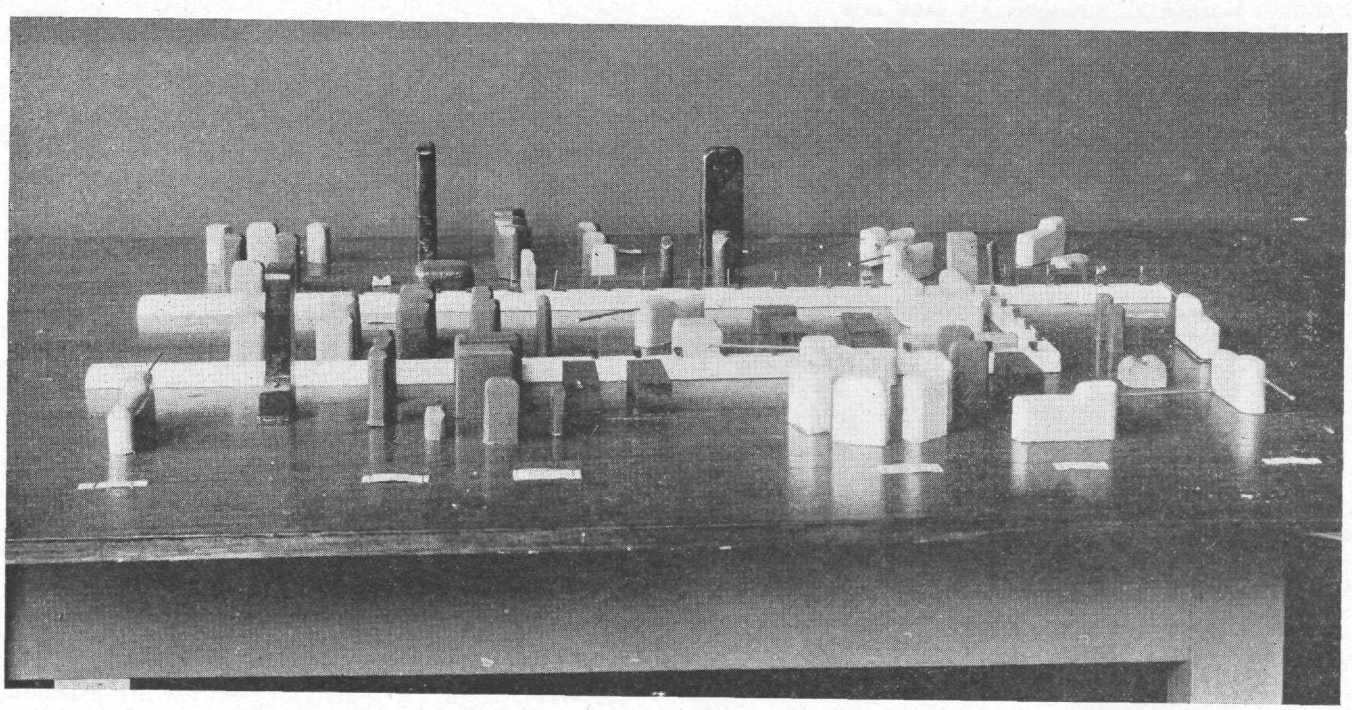

THREE DIMENSIONAL LAYOUT OF A DRILL PRESS FACTORY

The six machine group in the lower center represent a family of hobbing machines which are attended by one man who loads and unloads one machine per minute. The tall blocks are broaching machines used to finish flat surfaces such as the table and base drill pads. The light colored machines with lathe silhouettes and simulated bar stock (nails) represent lathes and screw machines. Drill press heads can be seen moving along the assembly line, represented by the raised strips through the layout, from the lower portion of the picture toward a junction with the main assembly line along which the progressively assembled drill presses can be seen.

MODELS

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collected at the Davis library. After we had spent several weeks in the library, inspected the Jeffrey Mfg. Co. in Columbus, and listened to several lectures on machine tools and their application by Professor Rickly of the Industrial Engineering Department, we had compiled sufficient data to give us the number of machines of each type to produce the drill presses and to give the cost of manufacture of the product as well as the total time to fabricate and assemble the various parts.

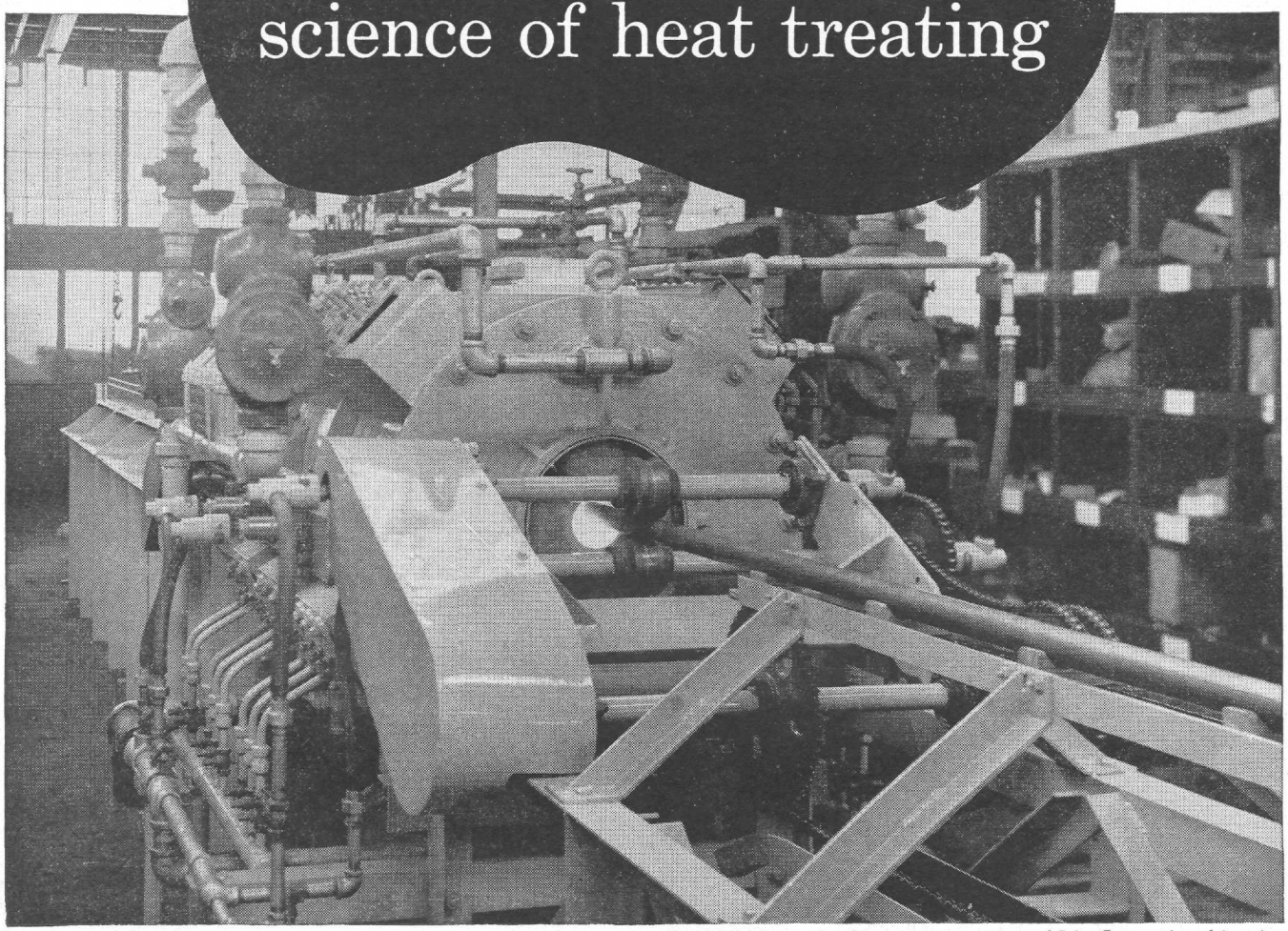
Our next step was to cut out the numerous small wooden blocks which were to represent the various machine tools. Because we had neither the time nor the patience to construct scale models of each machine we cut the blocks to overall scale dimension of the machines. Identification of the machines was accomplished by coloring them in accordance with the following color code:

Color	*Machine*
Green	Drill Press or Boring Mill
Blue	Milling Machine
Red	Broaching Machine
Gray	Lathes and Automatic Bar Machines
Black	Assembly and Inspection Benches

Operators were represented by small white sticks. The conveyorized assembly line was shown by strips of wood, high enough above the base to give the proper scale height for efficient working space. To give the whole thing an air of realism we made small models of the drill presses and located them on the conveyor line in their proper stages of assembly.

To the person who did not know the significance of the completed layout it appeared to be an attempt to simulate a multi-colored cemetery, but to us it was a very clear representation of a modern manufacturing plant. The advantages of this type of layout should not be underestimated; we found that even with our extreme inexperience in this field, we were still able to visualize the best material routing scheme in the shortest time and the fullest utilization of the available floor space possible by manipulating the models to their most advantageous position. Because the most important factors in production are good material routing and full utilization of the available floor space the three-dimensional layout system is the system to be used wherever possible, and, needless to say, the possibilities are unlimited. Models are being used not only in plant layout work but also in layouts of airports, railway terminals, and innumerable facilities of other kinds.

How Gas advances the science of heat treating



Gas-fired rod annealing furnace; photo courtesy of Selas Corporation of America

Research in Gas application, through the ceaseless study and experiment of equipment manufacturers, independent laboratories and the facilities of the American Gas Association, is constantly producing improvements and new departures in the application of heat, industrially.

For example, heat treating of metal rods in batch furnaces has certain disadvantages, particularly that of uneven heating throughout the bundle of rods. A group of engineers recently perfected a continuous-flow type Gas-fired furnace with a ceramic heating unit capable of intense, focussed heat, and closely fitted to the shape of the work in progress.

There are many advantages to this new Gas technique for annealing. For instance, one inch rod stock passing through a six foot furnace of the new type can be heated and quenched at a rate of 12 feet per minute, no section of the metal remaining under heat more than thirty seconds—against 2½ hours in a batch furnace. Furthermore, better uniformity of heating is achieved; scaling, distortion, decarburization are minimized. Floor space of the new furnace is 24 square feet against several hundred feet for the older type. Over-all costs are also considerably reduced.

Local Gas Companies help make these new benefits of Gas and Gas Equipment available to industry through the services of skilled Industrial Gas Engineers, who are available for consultation without obligation.

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